

Midwest Engineer

SERVING THE ENGINEERING PROFESSION



MISSOURI RIVER FLOOD PROBLEMS—PAGE SEVEN

WSE MEETINGS—PAGE TWO

Vol. 4

MARCH, 1952

No. 7

Honor - Hard Work - Great Responsibility

Every April, for the past 83 years Western Society of Engineers elects its officers for the following fiscal year. Each and every member must be aware that to be elected to any position on the Board of Direction is a signal honor. They know, too, that with it comes the burden of hard work and the yoke of great responsibility.

Nominating Committees of the Western Society have never overlooked these facts, nor have they ever nominated a candidate solely on the basis of his great accomplishments or long years of service for the Society. To do so would be unfair, because the nominee may have neither the desire nor the ability to guide the Society's business and its other affairs. In this case a disservice would be done the nominee as well as WSE. Throughout the years, that peculiar combination of honor, hardwork and responsibility, has been recognized in the selection of our leaders. Men have been nominated upon whom the membership could confer such an honor and who also, in a period of a year's leadership, were capable of guiding WSE so that it rendered the greatest possible service both to its members and to the particular segments of the profession and the community affected by its activities.

Nominating Committees have felt that the qualifications for our leaders should be of two kinds, personal and professional. They have felt that the nominee should be far above average in administrative and executive ability, and a public speaker of presence and poise; with integrity above question and with outstanding human qualities. They have felt that the nominee's record of professional service should be impressive, both quantitatively and qualitatively in three fields of endeavor: (1) his own field of business, (2) in the engineering field at large, and (3) in the Society itself.

Western Society of Engineers can feel confident that its prestige and influence will persist with the continued integrity of its Nominating Committees and with the interest and loyalty of each and every member.



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COVER STORY

During the disastrous floods in April 1952, those in the stricken areas fought to strengthen the weakening levees. As dawn broke on the morning of April 18, a long line of workers fed sandbags to the levee. The pipe shown overhead pumped seepage water into the Missouri River.

United Press Photo



May 26, The Joppa Steam Plant of Electric Energy, Inc.

SPONSORED BY THE ELECTRICAL ENGINEERING SECTION

John G. Koopman, general plant superintendent of the Joppa (Ill.) Plant is going to describe the design features of the plant. A semi-outdoor plant, it was specifically built to supply power to the Atomic Energy Commission plant which is situated on the Ohio River directly across from the Joppa plant.

Mr. Koopman's talk will be illustrated with slides.

May 28, Wednesday Noon Luncheon Meeting

Speaker for the luncheon meeting will be **Walter F. Lanterman**, television engineer with station WNBQ. His topic is "Television System Precision."

June 4, Wednesday Noon Luncheon Meeting

"What Price Government?" is the subject of the talk to be given by **Charles M. Hanna**. Mr. Hanna, a private consultant in labor-management relations, is speaking as a representative of the Illinois Citizens for the Hoover Report.

June 4, Annual June Meeting and Dinner at the Furniture Club

Details announced in this issue.

August 23, WSE Golf Tournament

To be held at the Chevy Chase Country Club in Wheeling, Ill. See details in this issue.

PLAN TO ATTEND

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Great Lakes Levels and Their Changes

By Horace P. Ramley, WSE

Assistant Chief Engineer
Sanitary District of Chicago

From a paper presented before the Western Society of Engineers, January 14, 1952.

Diversions have had less effect on Great Lakes levels than any one of the several items which have caused measurable changes in these levels. The effect of diversions has been greatly overemphasized in the public mind because of the bitter controversy over the Chicago diversion and because of the immense amount of propaganda for and against this diversion, over the past 30 years.

The effect of the diversion of 10,000 cfs from Lake Michigan at Chicago toward the lowering of the water levels of the Great Lakes was discussed before this society in 1888, by George Y. Wisner, who estimated the lowering effect at $2\frac{1}{2}$ to $3\frac{3}{4}$ inches. In the same year Lyman E. Cooley estimated it at $2\frac{1}{2}$ to $4\frac{3}{4}$ inches. In October 1894, T. T. Johnston, Assistant Chief Engineer of The Sanitary District of Chicago, the man who was really responsible for the design of the Chicago Drainage Canal, in a paper before the Western Society of Engineers, concluded that the lowering would be slightly less than 6 inches.

Thereafter various engineers and commissions, from time to time, reported on the lowering effect of a 10,000 cfs diversion. Figures from Lakes Michigan-Huron only will be listed. The effect on Lake Erie in all cases was estimated at about 1 inch less than on Michigan-Huron; and for Lake Ontario even less than Erie. Most of these estimates were:

| | |
|---|---------------|
| 1895—Poe, Ruffner, Marshall | 0.61 ft. |
| 1896—J. L. P. O'Hanley | 0.55 " |
| 1899—Marshall | 3 to 8 inches |
| 1905—Ernst, Bixby, Casey | 6 " |
| 1907—International Waterways Commission | 0.52 ft. |
| 1909—Noble, Sabin, Shenehon, Wheeler, Keller | 0.52 " |
| 1913—Bixby, Townsend, Keller, Cavanaugh, Bogart | 0.47 ft. |
| 1919—Warren, Richmond (8,800 cfs) | 0.43 " |
| 1925—Engineering Board of Review checked the Warren Report figures. | |
| 1926—Joint Board, St. Lawrence Waterway | 0.50 ft. |
| 1927—Special Master, Charles Evans Hughes | 0.50 " |

The outlet rivers of the various Great Lakes have been carefully calibrated by repeated current meter measurements, over many years, and their increments of discharge determined within acceptable limits. The increment of discharge is the increase in discharge, in cubic feet per second, due to an increase of one foot in the stage of the river.

Since the discharge curve for each of these large rivers is a flat curve, closely approaching a straight line at the high-

er stages, it follows that the increment for low stage is less than the increment for mean stage, which in turn is less than the increment for high stage.

Increments of the outlet rivers, the low stage being 1.5 ft. below and the high stage being 1.5 ft. above the mean stage, are substantially as follows:

| Stage | St. Clair | Niagara | St. Lawrence |
|------------|------------|------------|--------------|
| High | 20,800 cfs | 23,000 cfs | 23,700 cfs |
| Mean | 20,000 cfs | 21,800 cfs | 22,700 cfs |
| Low | 19,200 cfs | 20,600 cfs | 21,600 cfs |
| Mean Stage | 381.1 | 572.3 | 246.0 |

The actual diversion of water from Lake Michigan at Chicago, by decades, and the lowering of Lakes Michigan-Huron at the end of each of these periods (based on an increment of 20,000 cfs for the St. Clair River) is shown in the table below.

The diversion since January 1, 1939 has been limited to 1,500 cfs, annual average, in addition to domestic pumpage.

The effect of diversion of water from a large lake, such as Michigan-Huron, is by no means instantaneous. Considerable time, measured in years, is required for the readjustment of lake levels due to a

| | DIVERSION | LAKE LOWERINGS |
|-----------|-----------|------------------------------------|
| 1900-1910 | 5,069 cfs | 0.25 ft. = 3 inches |
| 1911-1920 | 7,992 cfs | 0.40 ft. = $4\frac{1}{2}$ inches |
| 1921-1930 | 8,745 cfs | 0.45 ft. = 5 $\frac{1}{2}$ inches |
| 1931-1940 | 6,664 cfs | 0.33 ft. = 4 inches |
| 1941-1950 | 3,113 cfs | 0.155 ft. = 1 $\frac{7}{8}$ inches |
| 1951 | 3,106 cfs | 0.155 ft. = 1 $\frac{7}{8}$ inches |

given diversion. The lowering of the lake lessens its rate of discharge through its natural outlet very slowly and 5 to 10 years time is required to establish equilibrium under the altered conditions, when the full effect of the diversion has been reached.

The lowering of Lakes Michigan-Huron, due to diversion of water, has been figured by the method of successive approximations and the percentage of the ultimate lowering is substantially as follows:

| | |
|-----------------|-------|
| End of 1st year | — 40% |
| " " 2nd " | — 65% |
| " " 3rd " | — 80% |
| " " 4th " | — 88% |
| " " 5th " | — 94% |
| " " 6th " | — 96% |
| " " 7th " | — 97% |

For all practical purposes the effect of the diversion is reached in about 5 years, when about 95 per cent of the lowering has been accomplished.

In the Warren Report (page 362) the statement is made that on Lakes Michigan-Huron, because of their great area, about four years time is required to effect 90 per cent of a change in level and 10 months to achieve 32 per cent of such change. On Lake Erie, however, because of its relatively small area, about 95 per cent of such a change is effected in 10 months.

At first glance, such times may seem very long, but the area of Lakes Michigan-Huron 45,400 square miles is so great that storage in the same to a depth of 6 inches would contain sufficient water to provide a flow of 10,000 cfs for 24 months, or two years. Storage to a depth of 6 inches on Lake Superior 31,800 square miles would supply a flow of 10,000 cfs for 17 months. The water accumulated in Lakes Michigan-Huron in the last two years of rising stage, 3.3 feet, from December 1949 to December 1951, has been sufficient to provide a flow of 10,000 cfs for 13½ years.

Diversion of water from Lake Michigan at Chicago is the only instance of diversion from the Great Lakes watershed into a different drainage basin. Its maximum effect, attained in 1929, was the lowering of the level of this lake almost 6 inches. Its present effect is a lowering of about 1⅞ inches. The Chicago Drainage Canal is an additional lake outlet, with a discharge capacity about 5.2 per cent of the capacity of the St. Clair River.

Diversion of water from Lake Erie through the Welland Canal into Lake Ontario is another case where an additional lake outlet is used, but where the water is returned to the Great Lakes System. The level of Lake Erie was lowered about 1¼ inches by an authorized diversion of 2,050 cfs through this canal, for power purposes, and an additional ⅝ inch by diversion of 1,050 cfs for navigation (1926), total lowering 1⅞ inches. Since the opening of the new (present) Welland Canal, with increased diversion for navigation, the lowering of Lake Erie caused by diversion through this additional outlet has been about 3 inches. The effect of this on the levels of Lakes Michigan-Huron has been about one-fourth as much, or approximately ¾ inch.

Diversions from the Great Lakes

Diversion of approximately 5,000 cfs, annual average, of water from the Hudson Bay watershed into Lake Superior has caused an average rise of about 3 inches in the levels of all the Great Lakes. The Hydro-Electric Power Commission of Ontario completed works July 1939 for the diversion of the drainage from 1,630 square miles around Long Lake, Can., and July 1943 for the diversion of the drainage from 5,545 square miles of the Ogoki River watershed into the Great Lakes. By international agreement, this water or its equivalent is used through Canadian power plants at or near Niagara Falls. This is in addition to any other allocation of the waters of Niagara River for power purposes between the United States and Canada.

The annual average diversion into the Great Lakes system has been about 1,000 cft from the Long Lake area, since 1939, and about 4,000 cfs from the Ogoki River, since 1946. The actual record of these diversions into Lake Superior has been as follows:

| | |
|-------|----------------|
| 1945— | 4,202 cfs |
| 1946— | 6,224 " |
| 1947— | 5,142 " |
| 1948— | 5,102 cfs |
| 1949— | Record missing |
| 1950— | 5,473 cfs |

The average of the five years on record is 5,228 cfs. This diversion was discontinued temporarily May 4, 1951, because of impending high water levels in the Great Lakes.

Summary of Changes in Lake Levels

Changes in the levels of Lakes Michigan-Huron, due to artificial causes, as computed by the Joint Board of Engineers on St. Lawrence Waterway Project in 1926, and for 1951 figures on the same basis, have been as follows:

| Divisions: | 1926 | 1951 |
|--|----------|----------|
| Chicago Drainage Canal | 6 in. | 1⅞ in. |
| Welland Canal | ½ in. | ¾ in. |
| Black Rock Canal | ½ in. | ¾ in. |
| Lowering, by Divisions: | 6½ in. | 2¾ in. |
| Rise, by Divisions into Lake Superior: | — | 3 in. |
| Net change by Divisions: | —6½ in. | +¼ in. |
| Outlet Changes: | | |
| St. Clair River enlargement | —7¼ in. | —7¼ in. |
| Total lowering, artificial causes: | 13½ in. | 7 in. |
| or | 1.15 ft. | 0.60 ft. |

The Engineering Board of Review, of The Sanitary District of Chicago, concluded that the retention of water in Lake Superior from 1917 to 1923 had lowered the levels of Lakes Michigan-Huron 3 inches by 1924, and that the low water yield of these lakes and Superior, 1919 to 1923, had caused a further lowering of 13 inches. This 16 inches added to the approximate 14 inches of lowering, due to diversions and outlet changes, represented a total lowering of about 30 inches in 1924-1925, the time of record low lake levels. The Joint Board of Engineers on the St. Lawrence Waterway Project concluded that the retention of water in Lake Superior had reduced the levels of Lakes Michigan-Huron some 4½ inches by 1922-1923, but that this had been restored by 1926. The total lowering as computed by this Board was thus about 18⅝ inches from artificial causes in 1922-1923.

Artificial changes in the levels of Lake Erie in 1926 and 1951 have been as follows:

| Divisions: | 1926 | 1951 |
|--|----------|----------|
| Chicago Drainage Canal | 4½ in. | 1½ in. |
| Welland Canal | 1½ in. | 3 in. |
| Black Rock Canal | ½ in. | ¾ in. |
| Lowerings, by Divisions: | 7½ in. | 5¼ in. |
| Rise, by Divisions into Lake Superior: | — | 2½ in. |
| Total lowering, artificial causes: | 7½ in. | 2¾ in. |
| or | 0.60 ft. | 0.23 ft. |

Compensating Works

The Joint Board, in 1926, assumed that the new Welland Canal would soon be in service and Lake Erie lowered

thereby an additional 0.10 foot to a total of 0.70 foot. This Board, not contemplating any reduction in the Chicago diversion and ignoring the possibility of the diversions of water into Lake Superior, recommended compensating works to raise the levels of Lake Erie 0.70 foot and Michigan-Huron 1.00 foot. The estimated construction cost was \$3,400,000.

Regulating Works

Regulation of the levels of the Great Lakes has been under consideration for the past 55 years. Regulating works for Lake Erie were recommended by the Deep Waterways Commission (Angell, Cooley, Russell) in 1896.

The Board of Engineers on Deep Waterways (Noble, Raymond, Wisner) reported in 1900 recommending regulating works for Lake Erie, for the benefit of navigation only.

The Regulation of Lake Erie was studied by the International Waterways Commission in 1910. The conclusion was reached that the levels of Lake Erie could be held between elevation 572.0 and 574.5, a range of 2.5 feet, and that the low-water stages of Lake Erie could be raised about 1 foot and those of Lake Michigan about 0.27 foot, without increasing the high-water stage in any case. The Commission concluded that the advantages were not sufficient to justify the construction of regulating works, composed of a dam and sluice gates near Buffalo.

The International Waterways Commission reported in 1913, recommending construction of a submerged weir diagonally across the Niagara River a short distance above the Falls, to raise the water level there 3 feet and by backwater to raise Lake Erie $4\frac{3}{4}$ inches. This was compensation instead of regulation.

Francis C. Shenhon, 1919, proposed plans for complete regulation of Lake Erie and Lake Ontario and the budgeting of the flow from these lakes. His proposal was to raise the average level of Lake Erie 13 inches, but not increase any flood stages; to equalize the discharge from the lake; and to hold the levels between elevations 572.0 and 574.0. The proposals for Lake Ontario were similar.

John R. Freeman, in 1926, recommended construction of regulating works in the St. Clair River, for Lakes Michigan-Huron, and in the Niagara River,

for Lake Erie, giving complete regulation of the discharge from all the upper Lakes. He stated that the water levels of the several lakes could be maintained 2 or 3 feet higher than the low levels existing in 1925, to the great benefit of navigation; and that minimum discharge from the lakes could be increased at least 20,000 cfs to the considerable benefit of power at Niagara and below. Levels of lakes Michigan-Huron were to be held within a range of 2.5 feet, and those of Erie within a range of 1.5 feet.

The Joint Board of Engineers on St. Lawrence Waterway Project, 1926, studied the regulation of the Great Lakes. A minimum discharge of 176,000 cfs out of Lake Erie was assumed and controlled discharge compared with actual discharge for the years 1894 to 1925, inclusive. The studies indicated that with regulation the levels of Lakes Michigan-Huron could have been held within a range of 2.4 feet, compared to the natural range of 3.5 feet, a gain of 1.1 feet, by control. On Lake Erie the levels could have been held within a range of 2.8 feet, compared to the natural range of 3.3 feet, a gain of 0.5 foot. The cost of regulating works was estimated at \$36,400,000. It was estimated that the same increases in depths of lake connecting channels and harbors could be obtained by compensating works and by dredging, at a cost of \$13,400,000. The conclusion was that construction of regulating works for the benefit of lake navigation could not be economically justified.

Divergent Interests

Three divergent interests are concerned about the levels of the Great Lakes: navigation, water power, and riparian owners. Of these three interests, navigation is paramount. The Board of Engineers for Rivers and Harbors stated, in the Warren Report 1920:

"Navigation, whether in artificial canals or in open water, is of higher value and importance than any other end served by the water of the Great Lakes."

Navigation is benefited by high lake levels because of the deeper draft for boats. Water power is helped by the higher lake levels, which indicate greater discharge. Only the riparian owner is damaged by high water, or rather by the storms that occur in times of high water and has little recourse.

Value of Water for Transportation

W. S. Richmond, in the Warren Report 1920, in an analysis of the value of draft for lake navigation, concluded that the loss of 0.10 foot in navigable depth caused an annual loss of \$590,000 to shipping in the Great Lakes.

Brigadier General Charles Keller, in a statement before the Foreign Relations Committee (H.R. 11,871, 65th Congress, 2nd Session) estimated the annual loss from 1 inch of impaired draft on Lake Erie at \$450,000 to \$600,000.

The Warren Report (page 93) contains the following statement relative to the value of water for transportation:

"The amounts by which the various lakes have already been lowered by existing diversions have been given (Michigan-Huron $5\frac{5}{8}$ inches, Erie 9 inches, Ontario 5 inches, St. Lawrence River, at Lock No. 25, $7\frac{1}{2}$ inches). The total loss to the bulk freight trade caused by this lowering is estimated at \$4,713,000 per year."

If a lowering of 0.10 feet in lake levels represents an actual annual loss of \$590,000 to navigation, then the lowering of Lake Erie 0.60 foot by artificial changes caused an annual loss of \$3,540,000 in lake transportation. The estimated cost, 1926, of compensating works to restore this depth was \$700,000 for Lake Erie and \$2,700,000 for Lakes Michigan-Huron, total \$3,400,000. Since this is less than the claimed annual loss to navigation, it is difficult to understand why nothing constructive was done regarding compensating works subsequent to 1926, when their construction was recommended.

Value of Water for Power

It was estimated, in 1920, (page 93 of Warren Report) that the value of water for power, at Niagara Falls, was \$500 per cfs per year, or about \$25,000,000 per year for the five companies then operating at the Falls and using about 50,000 cfs. At that time the most efficient plant was that of the Niagara Falls Power Company, using a net head of 208 feet and producing 2.3 HP from 1 cfs of water. New plants were contemplated to use a total head of 312 feet, including that of the Falls and of the rapids further downstream, and producing 29 HP from one cfs of water. The value of water for power, under this full

(Continued on Page 23)

Don't Miss the Highlight of WSE's Year!

Review of 1951-52

Introduction of New Officers

*Presentation of Honorary Membership
to Wilfred Sykes, Chairman of the
Executive Committee of Inland Steel*

*Presentation of Octave
Chanute Medal to:*

- Horace P. Ramey, Assistant Chief Engineer,
Sanitary District of Chicago.

Presentation of Service Awards to:

- Charles A. Blessing, Director of Planning Division,
Chicago Plan Commission.
- Clifford B. Cox, Secretary, Pacific Flush Tank
Co.
- Titus LeClair, Manager of Engineering, Commonwealth Edison Co. and Public Service Co.
of Northern Illinois.
- Charles L. Mee, Purchasing Agent, Public Service Co. of Northern Illinois.

Introduction of New Life Members

*Announcement of Prize Paper
Contest Winners*

- Norman E. Brown, Territorial Development Engineer,
Public Service Co. of Northern Illinois.
- James A. Stewart, Assistant District Superintendent,
Illinois Bell Telephone Co.

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NE Missouri River Flood Problems

Col. EDWARD A. BROWN,
Executive Officer
Missouri River Division
Corps of Engineers, U. S. Army

From A Paper
Presented before
WSE, October 1, 1951

The Missouri River, draining a tremendous area, contains approximately 530,000 square miles or one-sixth of the area of continental United States. It covers all or part of ten states: Montana, Wyoming, Colorado, North and South Dakota, Nebraska, Kansas, Iowa, Missouri and a small part of Minnesota.

From one end to the other the basin offers a wide diversity of geography and climate; the peaks of the Rockies, the semi-arid plains of the upper basin, grassy prairies, endless corn fields, waving wheat fields, and the rolling farm

lands and pine-covered Ozark hills of the lower basin. Elevations range from over 14,000 feet to 400 foot elevations at the mouth. Temperatures as high as 117 degrees and as low as minus 40 degrees have been recorded. Annual rainfall varies from six inches in the semi-arid region upwards to over 40 inches in the lower basin. This year set new high records for precipitation. Snow cover ranges from 20 inches in the lower valley to as much as 200 inches at places in the mountains.

Over 2400 miles in length, the Mis-

souri originates in Yellowstone National Park and southwestern Montana, and winds through or along the boundaries of seven states to its confluence with the Mississippi just upstream from St. Louis. The major tributaries, among the many that flow into the Missouri, are the Yellowstone, the Cheyenne, the Platte, the Kansas, the Grand and the Osage.

The priceless assets of the basin are its land and water resources. The economic status of the area follows closely the fortunes of agriculture since almost



Acme Photo

Landing operations were in order at Fort Riley, Kan. during the Kansas flood in 1951. More than 10,000 soldiers were evacuated to dry territory.

the entire economic structure of the basin is built around the products of agriculture. Agriculture is not only a dominant factor in the basin economy, but exerts a major influence upon the national economic structure. The basin contains about 25 per cent of the nation's cropland and its farms and ranches produce about 25 per cent of the corn, 30 per cent of the wheat, 1/5 of the butter, 1/6 of the pork, 1/5 of the beef, 1/4 of the mutton, and 1/3 of the wool of the United States.

Heavy industries in the basin are few. Important manufacturing industries include food processing, petroleum refining, and natural gas and coal production.

The population of the basin numbers about 8,000,000 people and, while fluctuations have occurred, the total has remained practically constant over the last 30 years, while at the same time the national population has increased more than 30 per cent.

Since land and water are the great

resources of the basin, it follows that the two main basin problems are floods and drought. The apparent solution then is to bring land and water into proper relationship with each other.

Droughts occurred during three recorded periods in the past; from 1835 to 1865, from 1886 to 1895, and the peak was reached during the Dust Bowl days of the 1930's.

In those semi-arid regions in the central and western parts of the basin, the small and erratic rainfall makes crop production without irrigation an extremely hazardous operation. The drought of the 30's caused a complete breakdown of the agricultural economy in many locations and a serious depletion in the livestock population. Irrigation is essential to supplement the dry farming and grazing in these areas and to provide a stable agricultural economy.

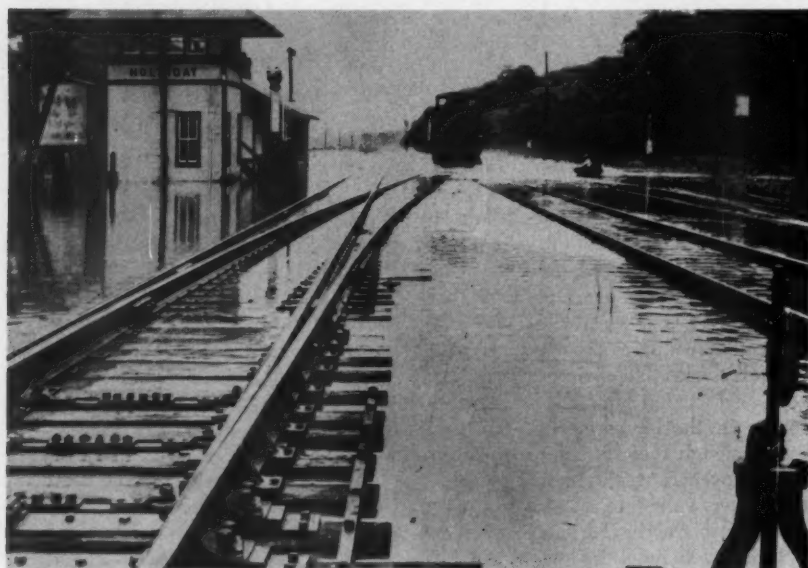
The highest flood of record in the basin on the main river occurred in 1844 and preceded the period of settlement. The succession of floods which followed exacted more and more toll as the area developed. Major floods occurred in 1844, 1881, 1903, 1908, 1915, 1927, 1935, 1942, 1943, 1947, 1951 and 1952.

Flood losses in the basin estimated at 10 million dollars in 1903 rose to 70 million in 1943, 110 million in 1947, and totalled 600 million between 1935 and 1950. Preliminary estimates of flood losses of the 1951 flood exceed one billion dollars.

It was not until 1936, about 15 years ago, that flood control was made a responsibility of the Corps of Engineers. In fact, prior to that time there was no established federal policy dealing with the flood control problem, although from time to time Congress had authorized certain specific flood control works. In the Flood Control Act of 1936, however, Congress recognized flood control as a responsibility of federal government and directed that the Secretary of War, through the Corps of Engineers, undertake the planning and construction of flood prevention projects as authorized by Congress.

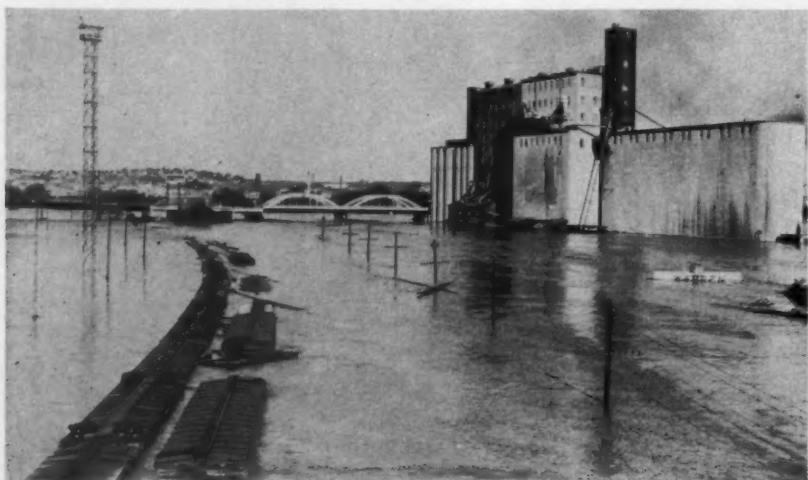
Soil erosion and water losses also are major problems in the basin. A farsighted program of land and water conservation is of great importance.

On various waterways in the basin, the flow is frequently so low during cer-



Acme Photo

A railroad track worker in a row boat (right, rear) watches as a freight train sprays water of the flooding Kaw River at Holliday, Kansas.



Acme Photo

Looking east from a bridge in the Kansas City industrial district, you see dozens of box cars under water, after the dikes in the area gave way. The grain elevator to the right was expected to go at any time from pressure and heat.

tain seasons that domestic and industrial water supplies are endangered and serious pollution problems are created. This problem is especially pronounced on the lower reaches of the Mississippi where large concentrations of population and industry occur.

In 1912 improvement of the river to provide a permanent navigation channel from Kansas City to the mouth was authorized. Appropriations, however, were not adequate to make sustained progress until 1927. Extension of the navigation and stabilization project upstream to Sioux City, Iowa, was authorized in 1927. Substantial progress was made until the last year when appropriations were severely curtailed and much of the control work was lost to the attack of the river due to the inability to effect proper maintenance.

In 1933, the construction of the great dam at Fort Peck was undertaken primarily for the regulation of flow for navigation. Since operation of the dam was begun in 1938, related benefits of flood control and hydroelectric power production have been realized, flood control benefits alone totalling \$51,000,000.

Since its formation in 1902, the Bureau of Reclamation of the Department of Interior had studied and developed individual irrigation projects in the Basin, and on an increasing scale had been giving attention to the irrigation of semi-arid land in the western part of the Basin. The drought of the 1930's brought the need for water conservation and irrigation into sharp focus.

Farmers and farm interests sought a means of saving their resources in fertile land, and to this end the Department of Agriculture was encouraged in the preparation of an overall program for development of land resources in the Basin. The program has yet to be approved and authorized by the Congress.

The droughts of the 30's and the floods of the early 40's brought into sharp focus the devastation and destruction resulting if land and water resources were left unfettered and unguided. Immediately following the flood of 1943, Congress requested recommendations to be taken to control these resources. The resulting plan which was the culmination of many years of thought and study provides the basic framework for the ultimate

development of the water resources of the basin.

This comprehensive plan for flood control and the development of water resources was approved by Congress in the Flood Control Act of 22 December 1944. The plan as approved is a consolidation and integration of two plans, both directed by Congress, one submitted in 1943 by the Corps of Engineers, and the other submitted by the Bureau of Reclamation in early 1944.

The plan provides for the construction of multiple-purpose reservoirs for flood control, irrigation, and development of hydroelectric power; the conservation of water for navigation and water supply; recreation and wildlife; local flood protection works; works for the irrigation of lands, and related uses. It is contemplated that the agricultural plan will be coordinated and integrated with the water resources plan.

The corps of Engineers portion of the plan includes a series of flood control and multiple-purpose dams and reservoirs on the main stem of the Missouri with some supplementary dams on the tributaries, a number of local protection works for flood control, the stabilization of the river channel from Sioux City to the mouth, and a series of agricultural levees below Sioux City. It should be noted that the construction of these levees would not be feasible without the stabilization of the channel. The Bureau of Reclamation's portion of the plan includes a large number of tributary reservoirs primarily designed for irrigation but adapted to multiple-purpose use where such was feasible.

The five main Engineer dams on the main stem in addition to Fort Peck, are the Garrison Dam and Reservoir

(75 miles northwest of Bismarck, North Dakota), Oahe Dam and Reservoir (near Pierre, South Dakota), Big Bend Dam and Reservoir (in central South Dakota), Fort Randall Dam and Reservoir (near Lake Andes, South Dakota), and Gavins Point Dam and Reservoir (near Yankton, South Dakota).

The physical characteristics of the dams on the main river are shown in the table below.

In addition to these main stem dams, the Corps of Engineers portion of the plan includes dams and reservoirs on many of the tributaries.

The ultimate goals of this tremendous plan envisage:

1. The provision for storage of well over one hundred and ten million acre feet of water for flood control, irrigation, power generation and other uses.
2. Irrigation of 5 million acres of new land and supplemental water for 1½ million acres now receiving inadequate supply.
3. Production of over 3 million kilowatts of power.
4. Agriculture levees along 1,500 miles of the Missouri below Sioux City, protecting 1½ million acres of farm land.
5. Local flood protection works at many cities.
6. Stabilization of the channel from Sioux City to the mouth in the interest of navigation.
7. Controlled stream flow during low water periods to improve municipal, industrial, and domestic water supplies.

The general benefits of the plan:

1. Stabilizing effect on agricul-

(Continued on Page 21)

| | Fort Peck | Garrison | Oahe | Big Bend | Fort Randall | Gavins Point |
|----------------------|------------|------------|------------|------------|--------------|--------------|
| Storage Capacity | 19,400,000 | 23,000,000 | 23,600,000 | 340,000 | 6,300,000 | 525,000 |
| Conservation | 11,400,000 | 13,850,000 | 14,600,000 | 340,000 | 2,400,000 | 210,000 |
| Flood Control | 3,500,000 | 4,250,000 | 3,500,000 | — | 2,500,000 | 165,000 |
| Dead Storage | 4,500,000 | 4,900,000 | 5,500,000 | — | 1,400,000 | 150,000 |
| Type of Dam | Earth Fill | Earth Fill | Earth Fill | Earth Fill | Earth Fill | Earth Fill |
| Height of Dam | 250 | 210 | 227 | 90 | 160 | 54 |
| Length | 21,000 | 12,000 | 9,800 | 9,000 | 10,200 | 7,000 |
| Use | Flood | — | — | — | — | — |
| | Control | — | — | — | — | — |
| | Sanitation | — | — | — | — | — |
| | Irrigation | — | — | — | — | — |
| | Navigation | — | — | — | — | — |
| | Power | — | — | — | — | — |
| Total Ultimate Power | 105,000 | 400,000 | 425,000 | 120,000 | 320,000 | 100,000 |
| % Completion | Complete | 41 | 3 | 0 | 45 | 0 |



Closeups of the

Washington Award Dinner



Left: Seated at the speaker's table are (left to right): Wilfred Sykes, Edwin Armstrong, Dr. Heald and E. Gordon Fox.

Below: President Becker presents the plaque to Dr. Heald.



On April twenty-first, 750 persons gathered to honor Henry T. Heald, the 1952 recipient of the Washington Award.

E. Gordon Fox (WSE), chairman of this year's Washington Award Commission spoke of Dr. Heald's vision, courage and proficiency in the fields of research and education.

Mr. Fox then introduced the members of the Commission: Leroy F. Bernhard, James D. Cunningham, W. L. Everitt, L. F. Harza, Louis R. Howson, Burgess H. Jennings, Roy A. Lindgren, George B. Massey, Verne O. McClurg, Albert Reichmann, J. T. Rettaliata, H. P. Sedwick, Ludwig Skog, Sr., Frank V. Smith, Wilfred Sykes and T. S. Washburn.

WSE president, Donald N. Becker, presented the Washington Award plaque inscribed:

THE
WASHINGTON AWARD
For Notable Contributions
To The Public Welfare Through
Engineering and Science
Conferred in 1952 Upon
HENRY TOWNLEY HEALD
For Distinguished Leadership
In Engineering Education
In Industrial Technology
In Scientific Research
And In Civic Affairs

Seated at the speaker's table, representing the participating societies were: J. T. Rettaliata, president of the Illinois Institute of Technology, representing ASME; Titus LeClair, manager of engineering for Commonwealth Edison and Public Service Co., representing AIEE; Dr. W. E. Mahin, director of research for the Armour Research Foundation, representing AIME; and W. W. DeBerard, city engineer, representing ASCE.

Speaking on behalf of the representatives of the participating societies, Mr. DeBerard (WSE) said of Dr. Heald, "His achievements at IIT and for the City of Chicago have left an indelible impression on the people of this community."

Tribute To Henry T. Heald

Delivered at the

Washington Award Dinner

by E. GORDON FOX, Chairman, Washington Award Commission

Part I

Three months ago the eyes of the world were directed to an area in the Atlantic Ocean off the coast of Ireland. The headlines of the world proclaimed the superb effort being made by the captain of the good ship Enterprise to bring his charge into port.

When Captain Curt Carlsen finally reached land at the seafaring town of Falmouth, England, the inhabitants of that town gave him a hero's welcome. He was accorded a similar ovation upon his later arrival at New York City.

We may draw two conclusions from this episode; first, that people the world over still recognize and admire outstanding devotion to duty; second, that they deem superlative performance as deserving of eulogy and acclaim.

This theme must have dominated the thinking of John W. Alvord, when in 1916 he established the Washington Award and proposed that it be conferred in recognition of devoted, unselfish and pre-eminent service in advancing human progress.

In perpetuating the tradition initiated by Mr. Alvord we are assembled this evening to do honor to a fellow engineer. We seek, through the acknowledgment and the declaration of his accomplishments, in some small measure to requite him for distinguished service which he has so signally rendered to this community, to this generation and to generations yet to come.

We, as engineers, are positioned to be keenly aware of instances of exceptional skill and unselfish devotion within our profession. It is fitting and proper that we should proclaim such knowledge to the public to the end that honor may be accorded where honor is due.

The Washington Award is administered by the Western Society of Engineers. The Commission of Award is comprised of 17 members. Three of these are past presidents of the Western Society, three are members of its Board

of Direction and three are elected from its membership at large. Two members are appointed by the president and the directors of each of the four national engineering societies generally termed the Founder Societies. The list of members of the Commission of Award is contained in the announcement of this meeting.

The appellation "Washington Award" was explained by Mr. Charles Loweth who presided as Chairman of the Commission when the award was conferred, in 1920, upon the first recipient, the Hon. Herbert Hoover. On that occasion, Mr. Loweth stated: "An award given to a professional engineer in recognition of notable public service, may fittingly be called the Washington Award in commemoration of the young engineer and surveyor who, by virtue of devoted service to his country, won the undying love of his countrymen and who is honored, throughout the years, as the Father of His Country."

This evening we consummate the 29th conferment of the Washington Award. The list of 28 former recipients of the award is to be found in your program. In this list you will note such names as Orville Wright, Charles Kettering, Arthur Compton, Vannevar Bush and Sen. Ralph Flanders. An award which carries the tradition of conferment upon so eminent a selection of men may indeed be viewed as a mark of true distinction.

Part II

Eight score and sixteen years ago our fathers brought forth on this continent a new nation, a nation dedicated to a new principle, that the citizen is vested with certain God-given rights, that he is at liberty to make his own decisions and to establish his own personal pattern of life so long as he does not trespass upon the equal privileges of others, and that Government has no sovereign rights and no inherent functions other than those voluntarily delegated to it by its citizens.

In the climate of this new concept of human relationships, promulgated under the guidance of George Washington, the people of the United States of America have evolved, for their mutual benefit, the highest level of material well-being the world has ever known.

In other portions of the world the age-old theme of government paternalism and government domination still prevails. In our own beloved nation there are those who harbor the hypothesis that government is endowed with occult powers of wisdom and beneficence and that we must look, not to ourselves, but to Washington, D.C., for our welfare, our security and our direction.

As engineers, we are fully aware of the fact that Utopia cannot be legislated, that the material well-being of our citizenry cannot be promoted by a mere shuffling of cards in the form of government intervention. We know that higher living standards for all can result only from prodigious production, from the provision of more goods for distribution in proportion to the recipient population. We know that this objective may be attained only by providing more tools and better tools for the worker, by backing him up with more electric or mechanical power, by devising new materials and new processes, by improving instrumentation and control, by organizing more effective methods and procedures.

The three-fold advance in our American standard of living effected in the past four decades is the result of one prime factor, technological advance. Two components which have contributed most significantly to technological advance are research and education, the discovery of the secrets of the universe and the development of personnel qualified to organize their application to the problems of our daily lives.

The man whom we seek to honor this evening has directed his endeavor primarily to these basically important fields

of research and education and he has made an imprint on the record in both of these causes.

As a result of his vision, his courage, his proficiency and his perseverance, one of Chicago's blighted areas is being transformed into a campus of beauty and utility. Here arises the Illinois Institute of Technology, an educational institution which is rapidly assuming a foremost rank in its field. Here has been established the second largest independent research center in the country, the Armour Research Foundation. Here also is to be found the Institute of Gas Technology, which has contributed importantly to research in its special field. This triumvirate of institutions, serving so well the people and the industries of the Chicago area, does indeed comprise a significant cog in America's defense bulwark and a beacon of promise for America's future.

But Dr. Heald's legacy to Chicago is not to be measured solely in terms of concrete and plaster. Of equal importance are his intangible contributions. These are hidden in the minds of the host of impecunious students to whom he brought the possibility of adequate education; or they are obscured in the products and the services of the several Chicago companies upon whose boards he served as a director; or they are incorporated in the sinews of the myriad of Chicago industries which have benefited from the research which he organized and directed.

We cannot ascribe to Dr. Heald the attributes which the present-day cartoonist associates with the cap and gown. He is not given to fuzzy thinking. He has no aversion to the profit motive. He sees no sin in success. He mingles recklessly with the sordid tycoons of finance. He

has a realistic perspective of American industry and its rightful place in our social structure. He does not condemn utilitarianism in education *per se*. He is an ardent exponent of close cooperation between the school which produces technical talent and industry which uses that talent. He has exploited to the fullest, the opportunities which the great industrial area of Chicago offers, for collaboration between the various fields of industrial production, research and education.

We find, in Dr. Heald, an exemplar embodiment of that sterling rectitude, that undaunted faith, that tenacious ardor and that sound judgment which constitute our finest heritage from our pioneering forebears and which are the root of America's greatness.

No higher tribute can be paid to any educator, in my view, than to say that his students may well emulate his example. Dr. Heald qualifies eminently for this characterization.

Seldom do we find a man so versatile in his interests and so generous with his many talents. Dr. Heald has served on innumerable committees and boards covering a wide range of technical, social, civic and religious interests and he always participated constructively. Typical was his service to the Western Society of Engineers on many committees, then as a trustee and eventually, in 1945-46, as president. Other official posts have included the presidency of the American Society of Engineering Education, the presidency of the Association of Urban Universities and the vice-presidency of the National Safety Council. He has served the Government and the Military on a number of advisory assignments.

The sheer number of Dr. Heald's

varied activities causes one to wonder whether he ever spent an evening at home. For permission thus to absent himself so frequently from home and fireside, to the great benefit of the public, we owe a debt of gratitude to Dr. Heald's gracious life-partner.

Contrary to Horace Greeley's advice, Dr. Heald has traversed from west toward east. Born in Nebraska and educated in the state of Washington, he has spent the prime of his life in Chicago and now leaves us to take up his abode on the Atlantic coast.

Soon after his graduation Dr. Heald became identified with Armour Institute of Technology. Through the years he advanced from assistant professor to associate professor to professor to dean to president. In 1940, at the early age of 36, he became president of the newly formed Illinois Institute of Technology, president of Armour Research Foundation and president of the Institute of Gas Technology. His recent selection as chancellor of New York University is the best possible evidence of his competent administration of his extensive official duties and his excellent performance of his many other voluntary activities.

Inevitably a man of such great attainments has received some measure of recognition. The degree of Doctor of Engineering has been bestowed upon Dr. Heald by Rose Polytechnic Institute, in 1942 and by Clarkson College of Technology in 1943. The degree of Doctor of Laws has been bestowed upon him by Northwestern University. He received a Distinguished Service Award from Chicago's own Junior Chamber of Commerce in 1940. In the same year the Illinois Junior Chamber of Commerce presented to him its Distinguished Service Award. He was the recipient of our Navy's award for Distinguished Civilian Service in 1945.

Dr. Heald has devoted unsparingly of time, thought and effort to innumerable activities directed to the public welfare. He has performed these services competently, faithfully, selflessly. No words of mine can add lustre to his achievements. No award can do him full honor. His works must constitute to him a great source of satisfaction.

It is now my privilege to present to you, the president of the Western Society of Engineers, Mr. Donald Becker, who will confer the award and Dr. Henry Townley Heald, its recipient.

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Education's Challenge

One of the outstanding educators of our time, Chancellor of New York University and this year's Washington Award Recipient, Henry T. Heald chose as his address a discussion of the moral, ethical and spiritual values in education.

By HENRY T. HEALD, 1952 WASHINGTON AWARD RECIPIENT

During the years I lived in Chicago I attended many Washington Award dinners. I served on the Washington Award Commission, and a few years ago, as president of the Western Society of Engineers, I was privileged to present the Award to Dr. Vannevar Bush. I was always inspired by such occasions, but it never occurred to me that some day I might be in the role of the recipient. Tonight as I look back over the list of my distinguished predecessors, I think that somehow, in 1952, the Commission must have made a mistake. But I am pleased and grateful. In singling me out for the Award, I assume that you really are expressing your approval of my former associates on the staff and the Board of Trustees of Illinois Institute of Technology, who have done so much to make that institution a vital center for research and education in this community.

And education is so important to all of us that I decided to talk about it tonight. The course of our national history in the next few years will be shaped by people. Their wisdom, or their folly, will derive partly from their native intelligence; but mostly it will come from acquired information and a sense of values implanted in their minds by their educational experiences. In short, colleges and universities will continue their traditional role as centers of learning and teaching and the search for truth. In a time of tension abroad and confu-

sion at home, education is indispensable to our national security and essential to our society.

Higher education is important. Almost everyone thinks so. The *Time* magazine study published early this month under the title "They Went to College" confirms this statement. More than 9,000 graduates were interviewed, and their replies formed the basis for a five-year study. The results show some very tangible benefits from a college education. College graduates occupy positions of leadership and prestige in their communities. They make more money. They hold the best jobs. They tend to be more stable in family and community life. They form the major opinion-making group. They participate in civic affairs. In general, they are good citizens.

Functions of Education

Higher education performs two major functions: it teaches the nation's youth and prepares them for useful citizenship, and it seeks to uncover new truths which extend man's knowledge and understanding of the world he lives in. More specifically, it supplies future executives for business, makes possible the development of new products and processes, and expands the market for our growing industrial output. As Laird Bell has said, "An educated public and a high standard of living go hand in hand."

It is easy to justify education on a ma-

terialistic basis alone. The *Time* study substantiates that view. The professions would wither and die without a continuing supply of trained manpower. Business and industry would stand still without the applications of technological research. Without our colleges and universities, our industrial effort would falter, our defense effort would lag, and our way of life would be further imperiled. This materialistic view alone is enough to justify education, and I do not propose to deal with it further tonight. What I am concerned about are the intangibles of the educational process—the moral, ethical, and spiritual values—and how they are used.

Education must assume a new, active, positive role in national and international affairs. We must educate people who are equipped to help solve complex problems in human affairs. We must supply men and women able to understand histories, prejudices, and cultures far different from our own, men and women able to translate this understanding into workable cooperation, mutual respect, and construction effort. This need transcends all others in the years ahead. If we succeed, we may enter a period of prolonged world peace and prosperity. If we fail, we shall be plunged into a disastrous world conflict which no one can win and from which we may never recover.

The key to our dilemma is intellectual

integrity. By that I mean a sense of moral, ethical, and spiritual values which places service above self. Education's job is to instill in each person a desire to perform a service which benefits mankind and makes society a little better. It need not lessen the emphasis upon preparing students to make a living, but somehow it must inculcate a sense of responsibility; a sense of unselfish mission in the common good.

We have gone through some trying and nerve-wracking times in the last 35 years. I listened recently to an address by one of my colleagues in which he recalled the period from 1885 to 1915 which Van Wyck Brooks has labeled "The Confident Years." This was a period of stability when, as my colleague said, "we felt secure in our freedom, in our institutions, and in our religious faith." Then came World War I, the depression, concentration of power in the federal government, the second World War, the world threat of communism, conflict abroad, and hopelessness and despair at home. He suggested that we call the period in which we are now living the "Years of Skepticism."

We are faced with a world responsibility which we cannot shirk. We did not ask for it, but we cannot avoid it. We cannot hope to be influential abroad unless we are strong at home. And this strength must be spiritual as well as material. We are concerned about

political and economic collectivism. We are spending billions of dollars of our resources to halt the spread of a collectivist philosophy in the rest of the world. But at the same time we must guard against collectivism at home.

Intellectual Collectivism

Not many of us question the need for individual initiative in business matters. We believe in a free competitive system of business enterprise. We still believe in the freedom and essential worth of the individual, and we are willing to support programs that will preserve individual political freedom. But are we as concerned about intellectual freedom? Or, to put it another way, are we as worried about a growing intellectual collectivism as we are about the threat of political and economic collectivism? I doubt that we are, but I am sure we should be.

Let me elaborate. Today, while we fight communism abroad, we are in serious danger of losing our freedom at home—not by government fiat but by personal default. Two attitudes may bring this about. One is the desire to conform. The other is the fear of being different. Both are really the same thing. They comprise what *Fortune* magazine has called "groupthink."

William H. Whyte, Jr., writing in the March *Fortune*, calls "groupthink" a

national philosophy and defines it as a "rationalized conformity—an open, articulate philosophy which holds that group values . . . are not only expedient but right and good as well." Mr. Whyte goes on to point out that this philosophy makes man completely a creature of his environment, more acted upon than acting. Absolute values disappear; there are no fixed precepts, only what the group thinks. Only by group participation is the individual's potential realized. Decisions are made by groups. The main objective of going to school is to get along with others.

This philosophy, I contend, submerges the individual. It produces, as Mr. Whyte implies, group judgments, group decisions, mediocrity of performance, and abject submission of the individual. It is, in effect, intellectual collectivism. It is dangerous for the individual and inimical to the best interests of society. It negates the freedom which our constitution and our form of government intend to reserve for every human being.

(Continued on Page 25)

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Reviews of Technical Books

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Analytical Mechanics

Analytical Mechanics for Engineers, by Fred B. Seely and Newton E. Ensign. John Wiley & Sons, Inc., New York. Fourth edition, 1952. 443 pages. \$5.50.

The principles of mechanics believed to be essential for the student of engineering stand out clearly in this book. Built up as much as possible from the common experience of the student, these principles are applied to concrete problems of practical value. The physical rather than the mathematical interpretation of the principle is emphasized.

This fourth edition is divided into three parts: Statics, Kinematics and Kinetics. Because of its simplicity and direct relation to the student's experience, statics is presented first. Both kinematics and kinetics have been developed with regard for the increasing importance of dynamics to engineers.

The more important articles are illustrated by problems that are practical, easily comprehended and free from unimportant details, so that the principles used in their solution are clear.

J.C.L., W.S.E.

Industrial Furnaces

Industrial Furnaces, by W. Trinks. John Wiley & Sons, Inc., New York. Fourth edition, 1951. 526 pages. \$10.00.

Among furnace engineers, the author's two volumes on *Industrial Engineers* are often referred to as "The Bible." The furnace bible deals with applications of discovery, research and science to the ever-changing practice of industrial furnaces. It must be kept up to date.

This fourth edition is brought completely up to date by the incorporation of the most recent scientific facts about heat transfer and furnace design, operating principles and techniques.

Practicing engineers have long regarded this as the most thorough exposition in existence of all phases and problems of practical technology. It discusses basic principles, provides graphic illustrations and offers conclusions that have been tested and proved in actual furnace practice. Unequaled in any language, it has been translated into French, German, Russian and Hebrew.

To designers and users of industrial furnaces who want to know how to get the best value out of the fuel they use and how to apply it most effectively, this revision is even more useful than previous editions.

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Dr. Rettaliata Installed as President of IIT

Presidents of two major technological institutions spoke May 22 at the Inauguration Convocation for Dr. John T. Rettaliata, new president of Illinois Institute of Technology.

Dr. John C. Warner, president of Carnegie Institute of Technology in Pittsburgh, and Dr. Detlev W. Bronk, president of Johns Hopkins University in Baltimore, delivered convocation addresses at the inauguration in the Civic Opera House.

Robed in the colors of their universities and degrees, scholars from dozens of educational institutions marched in the traditional academic procession which began the convocation.

A luncheon for delegates on the Illinois Tech campus preceded the convocation. After the convocation and a reception for delegates in the Opera House, a dinner at the Conrad Hilton hotel for special guests of the Institute completed the day-long ceremonies.

Although the colorful ceremonies formally installing President Rettaliata are ancient and traditional, the institution he heads is a growing and relatively new one. Illinois Tech was formed in 1940 through a merger of Armour Institute of Technology and Lewis Institute which were both established in the 1890's.

Besides being president of Illinois Tech, Rettaliata is president of two affiliated organizations. They are Armour Research Foundation and the Institute of Gas Technology, both located on the Institute's campus on Chicago's near south side.

Before his appointment as president last February, Dr. Rettaliata was dean of engineering and vice-president in charge of academic affairs at the Institute. He came to Illinois Tech in 1945. At 41, he is one of the youngest presidents of a major technological institution in the country.

James D. Cunningham, chairman of the board of trustees of the Institute, presided at the convocation in the Opera House.

Beardsley Ruml, noted economist and educator, spoke at the reception and din-

ner in the grand ballroom of the Conrad Hilton hotel. Ruml is chairman of the board of R. H. Macy & Co., Inc.

Axel H. Hofgren, president of the Illinois Tech Alumni Association, presided at the luncheon for delegates. President Rettaliata and Lester Arimour, member of the board of trustees of the Institute, spoke at the luncheon.

Other luncheon speakers were Frank H. Lerch, Jr., chairman of the Institute of Gas Technology board of trustees; Dr. Haldon A. Leedy, vice president and director of Armour Research Foundation; and Raymond J. Spaeth, vice president and treasurer of the Institute.

New Apartments For IIT Students

Illinois Institute of Technology will build a nine-story apartment building on Wabash avenue between 31st and 32nd streets, Chicago, it was announced by Dr. John T. Rettaliata, president of Illinois Tech.

Cost of the 96-unit building will be \$1,505,000. The completion of this latest project in Illinois Tech's extensive south side development program is scheduled for September, 1953.

The new structure will be the second of three proposed apartment buildings for housing students and staff of the In-

stitute. Its close neighbor will be Gunsaulus Hall, 3140 South Michigan avenue, completed in 1950.

The new building will be the fourth unit, two four-story dormitories having been completed, in Illinois Tech's long-range program to provide housing for its students and staff. The area from 31st to 35th streets, from State street to Michigan avenue has been designated as the Institute's housing area.

Architect for the new apartment building is Ludwig Mies van der Rohe, director of architecture at Illinois Tech.

Mississippi Valley Names New Officers

At the annual meeting of the shareholders of the Mississippi Valley Structural Steel Company held in late February, the present officers were re-elected, and a new company-wide office, that of executive vice president, was created. It was announced at this meeting that E. T. Blix, WSE, of 938 North Marion Street, Oak Park, was elected by the board of directors to this new office and would be in charge of sales and operations for the company's plants located at Melrose Park, Ill., Decatur, Ill., St. Louis, Mo., and Flint, Mich. Mr. Blix previously was vice president and manager of the Melrose Park plant.

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C. L. Warwick, Head of ASTM, Dies Suddenly

C. Laurence Warwick, Executive Secretary, American Society for Testing Materials, and its administrative head since 1919, died suddenly Wednesday evening, April 23, shortly after presiding at a dinner honoring the retiring treasurer of the Society. During the meal he complained of chest pains and after taking a sedative, continued, but died, probably from a severe heart attack, about an hour after the close of the affair.

Mr. Warwick had been active in the Society since 1909 when he graduated from the University of Pennsylvania in civil engineering. While he was instructor and assistant professor at the University, he also served as assistant secretary of ASTM with Edgar Marburg, the Society's founder secretary. In 1919, on the death of Dr. Marburg, he was appointed secretary-treasurer (chief executive officer) and in 1946 became executive secretary.

He had made many notable contributions to the field of standardization and research in materials and was recognized as an outstanding authority on materials. One of his important contributions was in the War Production Board during World War II, where he served as Head of the Specifications Branch of the Conservative Division, and later headed the Materials Division. This work resulted in tremendous savings of critical and strategic war materials through the issuance of emergency standards and in other ways.

Mr. Warwick was a commissioner, later headed the Commission of Radnor Township, Delaware County; was a member and former vice-president of the Engineers Club of Philadelphia, and affiliated with several engineering groups including the American Society of Civil Engineers, American Association for Advancement of Science and American Society for Metals.

He had written a large number of technical papers and reports dealing with properties and tests of engineering materials and especially standardization of specifications and tests. He was a member of Sigma Tau and Sigma Xi, honorary societies.

The Society, which had been the focal point of his business and technical life, is this year commemorating its 50th Anniversary during a week long meeting in New York City, June 23-27.

Joshua D'Esposito Honored By Chicago Building Congress

Joshua D'Esposito, consulting engineer and honorary member of WSE and Elmer C. Jensen, dean of Chicago architects, were honored by the Chicago Building Congress at a testimonial dinner held at the Bismarck Hotel on May 6.

Speaking for the Western Society of Engineers, President Donald N. Becker said to Mr. D'Esposito, "On behalf of the Western Society of Engineers, I wish

to congratulate you on the well-deserved honor which is being bestowed on you this evening by the Chicago Building Congress.

"We at Western Society recognized your outstanding ability by awarding you an honorary membership in 1950 and are proud to have this additional honor bestowed upon one of our illustrious members."

Founded in 1938, the Chicago Building Congress is an organization of individuals, firms, corporations and labor unions directly or indirectly engaged in the building industry in its widest possible scope. Its aim is to cultivate the spirit of good will and cooperation within the industry, and assist in the procurement of adequate state and local legislation related to regional and city planning, zoning, the subdivision and development of land, building codes and equitable assessment of property.

The affair, attended by more than 400 people, was marred by the absence of Mr. D'Esposito who was in Evanston Hospital. He was represented by his son.

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WSE Personals

Edward J. Doyle, president and director of the Commonwealth Edison Co., will receive an honorary Doctor of Laws degree from the University of Notre Dame at South Bend, Ind. The degree will be conferred at commencement exercises to be held June 1.

This month **Dr. Gustav Egloff** commuted to the east and west coasts of the United States to attend several meetings. On May 7 and 8, he attended the annual meeting of the American Institute of Chemists at New York City. Dr. Egloff also attended the American Petroleum Institute Convention held at San Francisco, May 12-15.

On May 22, on the occasion of the Fourth Annual Honor Scroll Award of the New York Chapter of the American Institute of Chemists to Foster D. Snell, Dr. Egloff spoke on "Foster D. as I Know Him."

Harold K. Hastrup (WSE), a member of the firm of Krol and Hastrup, Engineers, has announced that their new offices are located at 180 W. Adams Street in Chicago.

John P. Tansey, member of Western Society, now is assistant service manager at Motorola, Inc. Mr. Tansey formerly was assistant to the commissioner in the Department of Public Works for the City of Chicago.

Louis L. Santoro, a member of Western Society, has been named assistant superintendent of plant facilities for the Armour Research Foundation. He had been building superintendent for Butler Brothers.

William C. Schofield has been assistant production manager of the Freyn Engineering Department of the Koppers Co. During his 32 years with Freyn he has been chief draftsman, assistant chief engineer and chief engineer.

A member of the Western Society since 1923, Mr. Schofield is a past chairman of the Mechanical Engineering Section.

William A. Kesl, an associate member of Western Society, now is in the engineering department of the Baltimore & Ohio Railroad Co., at Pittsburgh, Pa. Mr. Kesl graduated from the Illinois Institute of Technology in August 1950.

Obituaries

Western Society headquarters has just been informed of the death, several months ago, of **Carl W. Benz**. A member of WSE since 1935, Mr. Benz was executive vice president of the International Railway Car & Equipment Manufacturing Co., at Kenton, Ohio.

James C. Daley, a member of Western Society since 1948, died May 15. Chairman of the Board of the Jefferson Electric Co., in Bellwood, Ill., Mr. Daley came to Chicago from Kingston, Ontario, in 1913. Two years later he helped found the electric company of which he had been chairman since 1947.

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Architects and Engineers Work For Art Institute Fund

Charles W. Nicol, president of C. W. Nicol and Associates, has been appointed chairman of the Architects and Engineers Group seeking subscriptions for the Art Institute Emergency Fund Campaign for \$1,600,000, it has been announced by Everett D. Graff, vice-chairman of the Campaign and chairman of the Corporations and Firms Department.

Two hundred and eight corporations and firms have already subscribed \$270,000 to the fund in connection with

a preliminary solicitation conducted by trustees and a special committee of young business men headed by Arthur M. Wood and Edward Byron Smith.

The money being raised is urgently needed for major rehabilitation to the 60 year old building including replacement of the heating system, meeting increased operating expenses and providing additional gallery space within the present building. This is the first public appeal ever made by the Institute in its 73 years.

The tie between business and the Art Institute is close, the men declare, pointing out that business operates best in a community that is rich in cultural and educational value. Such a community attracts the best type of workers from executives to apprentices.

This is a recognized fact used to attract business to Chicago. The Art Institute, along with other great Chicago institutions, is held out to industry as one of the advantages of locating in or near Chicago.

Of direct benefit to business is the importance of art in the design and promotion of the products of industry. Art has a close contact with modern life through industrial and commercial application. There are countless examples of fabrics, household and sales room decorations, appliances and even automobiles and locomotives that trace the origin of their design to a museum of fine arts. The final appearance of a product is largely the application of art to good merchandising, it has been stressed by the business men working with corporations in the Art Institute Emergency Fund Campaign.

There are few days at the Art Institute, that representatives of Chicago business do not study some object—paintings, textiles, porcelain, furniture or jewels—in search of a design that will help to sell some product of industry. The library in the Institute is used throughout the year for research and study of slides and photographs.

The School of the Art Institute is the largest and one of the most important in the world. Thousands of young men and women study subjects that will prepare them for jobs in business and industry—or that enhance their qualifications for advancement in their present jobs and thus their value to their employers. The Institute as an educational institution makes very real contributions to the industrial and commercial life of the Chicago area.

Other recent appointments on the committee to serve with William O'Neil, President of the W. E. O'Neil Construction Company and Chairman of the Architects, Engineers and Building Industry Division are: Col. Henry Crown, President of Material Service Corp., Chairman of the Building Materials Group, and Sidney Marks, Vice-President of Material Service Corporation, Vice-Chairman of the Building Material

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Geographical Survey Data Available Now

An office of the U. S. Coast and Geodetic Survey located at 185 N. Wabash Avenue, Chicago, Illinois maintains a reference file of all United States aeronautical charts produced by the Coast and Geodetic Survey; also, World Air Coverage charts for foreign areas pub-

lished by the U. S. Air Force. There is also maintained for Region 3—which comprises the following states; Illinois, Indiana, Michigan, Minnesota, Ohio, Kentucky, North Dakota, and Wisconsin—a complete file of geodetic control data both triangulation and levels, such as descriptions and geodetic positions of survey points located by triangulation, and descriptions and elevations of geodetic bench marks. Information on all survey marks which are connected to state plane coordinate systems are also available.

Geological Survey quadrangle maps of Region 3, are on file and Geological Survey data containing descriptions and elevations of survey marks in Cook County are accessible.

Data is maintained for public reference and advice regarding its use will be given when requested. Office hours are from 8:30 a.m. to 5:30 p.m. daily, except Saturdays and Sundays.

(Continued from Page 9)

tural pursuits will go far to improve the general economic conditions.

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1951 Flood

The July flood in Kansas originated almost wholly on the Kansas River and its tributaries. It was the result of a two-months buildup of soaking rains,

climaxed by a three-day storm which began July 9 and ended on the morning of July 12. In May, June, and the first week of July, repeated rains in the Kansas Basin totalled from 15 to 30 inches, equalling or exceeding the average rainfall for the entire year. The rivers were bank full and the ground thoroughly saturated when the climaxing storm occurred. The result was the greatest flood of record on the Kansas, and a near all-time record on the Missouri below Kansas City. Greatest industrial damage was at the twin Kansas Citys, where four major industrial areas were flooded when local levees were overtopped or breached.

The enormity of the flood losses was indicated in preliminary estimates made immediately after the crisis was past. These figures, subject to revision when more current surveys are completed, are shown in the table below.

| | Kansas | Missouri | Total |
|---------------------------------|---------------|---------------|---------------|
| Acres flooded | 1,074,000 | 926,000 | 2,000,000 |
| People displaced | 368,500 | 150,000 | 518,500 |
| Major bridges lost | 17 | | 17 |
| Railroad rolling stock affected | 22,100 | 65,000 | 87,100 |
| Livestock lost or stranded | 7,000 | 9,000 | 16,000 |
| Flood loss | \$813,000,000 | \$177,000,000 | \$990,000,000 |

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WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions,

and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RANDolph 6-1736.

- | | |
|--|---|
| 215-83 John Langas, Civil Engineer I, City of Chicago, Department of Subways & Superhighways, 20 N. Wacker Dr. | 229-83 Alan D. Burnett (Rein.), Engineer, Illinois Bell Telephone Company, 208 W. Washington St. |
| 216-83 Eugene D. Lanigan, Sales Engineer, General Electric Co., 840 S. Canal St. | 230-83 Edward P. Brand, 1609 Albion Ave. — attending Illinois Institute of Technology. |
| 217-83 LeRoy W. Block, Sales Field Man, National Electric Products Corp., 2300 W. Division St. | 231-83 Rupert F. Graham, Structural Engineer II, Department of Subways & Superhighways, 20 N. Wacker Dr. |
| 218-83 Loren E. Howe, Field Assistant Supt., James Stewart Corp., 228 N. LaSalle St. | 232-83 Edward R. Simonson, Civil Engineer I, Department of Subways & Superhighways, City of Chicago, 20 N. Wacker Dr. |
| 219-83 Richard E. Meagher (Rein.), Field Engineer, Commonwealth Edison Co., 72 W. Adams St. | 233-83 John D. Armstrong, Project Engineer, Petersen Oven Co., Franklin Park, Ill. |
| 220-83 William H. Richardson, Engineer; Alvord, Burdick & Howson, 20 N. Wacker Dr. | 234-83 Eugene C. Bailey, Assist. to Mgr. of Power Prod'n., Commonwealth Edison Co., 72 W. Adams St. |
| 221-83 Henry J. Schaffler, Senior Engineer, Commonwealth Edison Co., 72 W. Adams St. | 235-83 George C. Laughlin, Supt. of Struct. & Mech. Div., Commonwealth Edison Co., 72 W. Adams St. |
| 222-83 H. J. Vahrenwald (Rein.), Assistant Chief Engineer, Compco Corp., 2251 W. St. Paul Ave. | 236-83 Thomas J. McGovern, Supervising Field Engr., Commonwealth Edison Co., 72 W. Adams St. |
| 223-83 Daniel J. O'Donovan, H. S. Cutmore & Associates, Inc., 38 S. Dearborn St. | 237-83 Vern L. Stone, Manager of Power Prod'n., Commonwealth Edison Co., 72 W. Adams St. |
| 224-83 Ralph F. Huisinga, Equipment Engineer, John Mohr & Sons, 3200 E. 96th St. | 238-83 James Budzileni, 1315 Elmdale Ave. — attending Illinois Institute of Technology. |
| 225-83 John M. Scanlan, Const. Est. & Exp. Control Engr., Illinois Bell Telephone Co., 212 W. Washington St. | 239-83 George H. Freundlich, Application Engineer, Meters & Controls, Inc., 444 N. LaSalle St. |
| 226-83 Peter W. Voss, President, P. W. Voss & Associates, 918 S. Michigan Ave. | 240-83 Harry J. Kolkebeck, Plant Equipment Engr., Ford Aircraft Engine Division, 7401 S. Cicero Ave. |
| 227-83 Robert L. Cox, Traffic Engineer, Chicago Motor Club, 66 E. South Water St. | 241-83 Robert J. Bushelle, Engineer, Illinois Bell Telephone Co., 208 W. Washington St. |
| 228-83 Edward P. Straka, 1322 Ridgeland Ave., Berwyn, Ill. — attending Illinois Institute of Technology. | |

(Continued from Page 5)

head it was estimated at \$834 per cfs a year.

In addition to the saving of money, there is the further value in the conservation of the coal supply of the Nation, and in the impetus which cheap power has given to the various electro-chemical industries.

Riparian Interests

The opinion of the War Department as to the effect upon riparian interests of varied lake levels, as stated in the Warren Report (page 73) is as follows:

"In the sheltered waters of the Great Lakes the lowering of water levels works serious hardship to many of the riparian owners. In such places there are a great many boathouses, dredged slips and small private docks. These are built to suit the prevailing stages of the lake, and their value is much impaired at low stages. * * * The experience of the War Department has been that many more complaints are received because of low stage than because of high. It is believed that this matter of riparian interests constitutes but a very minor part of the problem of lake levels."

If riparian owners have been misled, by the low lake levels prevailing for several years past, into building structures on the foreshore which will be injured by a return to these higher lake levels produced by natural conditions in the past, they have done so at their own risk.

In Lake Michigan, the high water of 1838 was elevation 584.7 feet above mean sea level. Later high monthly averages have been:

| | |
|----------|------------|
| August | 1861—583.3 |
| July | 1876—583.4 |
| June | 1886—583.4 |
| July | 1917—581.8 |
| July | 1929—582.3 |
| August | 1951—581.6 |
| December | 1951—581.6 |

Recent high levels have been lower than the high level of July 1929 which, in turn, was a foot lower than the high levels of 1861, 1876, 1886 and more than two feet below the high water of 1838. *The high water in 1952 will probably exceed the high level of 1929 and may approach the high water of 1886.* The reason, of course, is excess precipitation which was 31 per cent above normal in the year 1951, being 39 per cent

above normal in December 1951, at Chicago; and expected to continue into 1952.

A contributing factor is the discharge of more than the normal amount of water from Lake Superior, to lower its high stage. In December 1951 the discharge from Lake Superior was at the rate of 121,000 cfs for the first 16 days and about 85,000 cfs thereafter, an average of 103,600 cfs for the month. The record discharge from Lake Superior, for a month, has been 127,100 cfs and the average about 75,000 cfs. Apparently the levels of Lake Superior are being regulated with little regard to the level of the lakes below.

This abnormal discharge from Lake Superior in December caused Lakes Michigan-Huron to rise $\frac{5}{8}$ inch above their November 1951 level to a point $\frac{1}{4}$ inch higher than the high summer level of August 1951. This is the first time in history that the December level of Lake Michigan-Huron has exceeded the summer level, in any year. While Lake Superior was being lowered about 3 inches, Lakes Michigan-Huron were raised $\frac{5}{8}$ inch, Lake St. Clair more than 5 inches, Lake Erie $1\frac{1}{4}$ inches, and Lake Ontario remained about the same. Under natural conditions the levels of these lakes almost invariably dropped, from November to December.

Nothing can be done about the high levels of Lake Michigan, immediately. No more water than its present flow can be discharged through the St. Clair River and even this may be reduced by ice obstruction in such a cold winter as this last one. The only other outlet, the Chicago Drainage Canal, if used to its full discharge capacity, would lower the lake level about 4 inches more than at present, in about 5 years, but only $1\frac{1}{2}$ inches the first year. Even that would help but this serves to illustrate the small effect that diversions have had on lake levels.

The ultimate lowering which would be caused by the diversion of an additional 2,000 cfs, needed to produce a clean stream throughout the Illinois Waterway, would be only $1\frac{1}{8}$ inches, of which about $\frac{1}{2}$ inch would occur in the first year.

All diversions had lowered the levels of Lakes Michigan, Huron and Erie by about 7 inches, at most, in 1926. Now (1952) the effect on Michigan and Huron is practically nil, and the lowering of Lake Erie less than 3 inches.

Conclusions

Little can be done about the temporary brief changes in lake levels due to natural causes such as winds and seiches. Tides are of no consequence. Little can be done about the retardation of inflow due to freezing of tributary streams, but the ice effects on the outlet channels could be reduced by the successful operation of ice breakers. Compensation for the slow, long time efforts of earth tile can be effected by modification of the lake outlets, when and if a correction is desirable.

Changes because of diversions can be corrected by compensating works but the present effect of diversions on Lakes Michigan-Huron is practically nil, and on Lake Erie only $2\frac{3}{4}$ inches of lowering. Compensating works such as outlet enlargements would also correct outlet changes.

No change is desired in the annual cycle, in which lake levels are about a foot higher in summer than in winter. Navigation, the paramount interest, receives the benefit of increased channel depths during the navigation season, March to November.

The higher summer levels cause greater discharges in the warmer months. Power interests could make better use of larger discharges in the winter months. This desire of the power interests has been met in the recently ratified 1950 treaty between the United States and Canada, under which all the waters of the Niagara River, except 50,000 cfs are authorized to be used for power purposes, from November 1 to March 31. In the daylight hours of the remaining seven months of the year, the tourist season, 100,000 cfs is reserved by scenic beauty at Niagara Falls, but in the night hours only 50,000 cfs.

Changes in lake levels due to the long time cycles of deficient and excess rainfall cannot be eliminated. The amplitude of these changes, however, could be reduced materially by the proper operation of regulating works for all the Great Lakes. Lake Superior is now regulated and its outflow is subject to close manual control. Lake Ontario will become regulated when the first dam is built in the St. Lawrence navigation and power project. Only Lakes Michigan-Huron and Erie will remain unregulated. Because of the relatively small area of this lake, it is particularly susceptible to

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control. Changes in its level can be effected in a comparatively short time.

The remedy against excessive future high lake levels, and low lake levels as well, appears to be regulation of all the Great Lakes with the discharge capacity of the outlet channels increased about 25 per cent. This would permit the passage of more water through the lake system in the years of over-abundant supply and guard against dangerously high levels.

At present only Lake Superior is regulated and is the only lake having greatly increased outlet capacity. Discharge capacities of the St. Clair and Niagara Rivers have been increased to some extent but by no means to the 20 or 25 per cent needed. As for Lake Ontario the discharge capacity of the St. Lawrence River, its outlet, has been reduced at the Galops Rapids by the Gut Dam. This will no doubt be corrected and the cross section at that place considerably enlarged when the St. Lawrence power project is constructed.

The serious complaint 25 and 30 years ago was because of low lake levels. Today there are many complaints because of high lake levels.

Great Lakes Case

It has been suggested that efforts be made to obtain a modification of the United States Supreme Court decree, which limits the diversion of water at Chicago to 1,500 cfs annual average, in addition to domestic pumpage. Even if an increase in this diversion would have a marked effect on lake levels (which is not the case) the impracticability of relief through such court action is obvious to anyone familiar with the Lake States litigation.

In the original hearing of this case, Special Master Hughes recommended

November 1927 that the bill for injunction, filed by the Lake States, be dismissed. The Supreme Court did not follow this recommendation but, in the Taft opinion, January 14, 1929, decided that in the absence of any affirmative action by Congress the diversion, since it was for purposes of sanitation, had no legal basis and that the complainants were entitled to a decree. The case was then referred to the Special Master to determine what measures were necessary for the disposition of the sewage of the Sanitary District through other means than diversion of water from Lake Michigan and to determine what diversion would be necessary for maintaining navigation in the Chicago River, as a part of the Port of Chicago, after the sewage disposal works were in operation. The Special Master concluded that this latter figure should be 1,500 cfs annual average in addition to pumpage.

Testimony regarding rising lake levels was presented in the trial of the case on re-reference; and in his report on re-reference, December 1929, the Special Master found that the mean levels of Lakes Michigan and Huron had risen approximately 3 feet 9 inches from July 1926 to July 1929; and that during this same period the levels of Lakes Erie and Ontario had exhibited a corresponding relative rise. He stated that:

"The change in lake level cannot be taken to modify the decision of this Court with respect to the legal rights of the complainants in relation to the diversion, or as to the nature of the ultimate relief to be awarded. The evidence, however, was received in order that the Court may have the facts before it in considering the provisions of its decree."

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Notes and News

"If one studies the history of science he must be impressed by the fact that discovery and measurement have gone hand in hand. Permanent achievements have been won, for the most part, by careful observations of phenomena and the construction of theories, subject to numerical formulation and test, for their interpretation. It is this tabulation of experience which probably most thoroughly differentiates the scientific from the unscientific."

Thus reads an opening paragraph in "A Bibliography and Index of Mathematical Tables," (1949) prepared under the direction of Harold T. Davis of Northwestern University. Only recently acquired by the Library, this work is singled out for special attention because it is the kind of "tool" which can easily escape the attention of the serious investigator. A fantastic amount of work has surely gone into its compilation. The index lists "Tables Relating to Engineering," "Geodetic Tables," tables in "Aerodynamics, Hydrodynamics, Ballistics."

Almost any subject can be expected to have its literature. A reminder of this is given by a recent book on "Insects as Human Food," by F. S. Bodenheimer, published in The Hague, 1951. It isn't the first. The Library also has a book published in 1885 with the provocative title, "Why Not Eat Insects?" The author's motto: "The insects eat up every blessed green thing that do grow and us farmers starve. Well, eat them and grow fat!"

A still earlier book, "The Curiosities of Food" (1859), has a chapter on insects. This cites a recipe by a 1772 writer. He says of insects; "They are eaten by the French, in the West Indies, after they have been roasted before the fire, when a small wooden spit has been thrust through them. When they begin to be hot, they powder them with a crust of rasped bread, mixed with salt and a little pepper and nutmeg. This powder keeps in the fat, or at least, sucks it up; and when they are done enough, they are served up with orange juice."

This makes it less surprising to see a notice in *The Wall Street Journal* for April 9, 1952, that OPS through its GOR-7 had freed fried worms from price control.

(Continued from Page 14)

Today we are too prone as individuals to feel helpless. We like to hark back to a day when life was simple and the pace was slow. It was easier then for the individual to control his environment. He lived on a farm, or, at worst, in a small town. He was not bothered by crowds, or city canyons, or airplanes. He took his time and made his own decisions. He was not worried about the atomic bomb. Those were the "good old days."

But were they? Did he live as long? Did he have as many physical comforts, or as much chance for understanding? Was he not just as dead when an arrow pierced his heart as any of us would be today if an atomic bomb fell near us? I am not sympathetic with the contention that all of our problems could be solved easily and quickly if we just had not come so far so fast. Technological advances have not nullified the opportunity of the individual to do something about his environment. His environment is just larger, and he simply needs to think about it in a new context.

But in so doing, he need not go along with the crowd. As Mr. Whyte contends in *Fortune*, a sense of belonging and a sense of meaningful association with others have never required that individuality be sacrificed. Each of us needs more understanding and more know-

ledge about more things, and that takes more time and harder work. The major threat to American life is this: that we will lose our freedom while we talk about the principles of freedom. Only alert individuals, well-informed, fearless, and motivated by high moral values, can stem the tide of collectivism, whether it be political, economic, or intellectual.

Clarence Randall has, I think, hit the nail squarely on the head in an article he wrote recently for the *Atlantic*. He said that business leaders should be tops in their jobs, but competence alone did not establish them as leaders in their communities. The same can be said of engineers. Then he asked:

"Who among us is superintendent of a Sunday School, or is having a part in some other character-forming agency? We decry double morality in government and corruption in high places; yet what as businessmen are we doing to form sturdy characters in the young men and women who will bear those responsibilities in another 20 years? We turn to the universities for the best brains they have to bring into our businesses. We seek them avidly. What are we doing about maintaining those educational institutions? We know perfectly well that with a privately endowed institution the student's tuition pays less than half of the cost of that education. Are we willing to take that education as a gift to us and do nothing to perpetuate those institu-

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tions that mean so much to us? Who among us seeks out the principal of the local high school and brings him home to dinner for a chat, and who invites the professors of the colleges and universities to his business places that they may understand first-hand his business problems? Who among us takes the active part in the day-to-day political life of our nation that he should?"

Now I am not making a case tonight for privately supported higher education, but I subscribe to everything Mr. Randall says about that. What I am trying to illustrate is that every individual, as Mr. Randall points out, has a personal responsibility that he and he alone can discharge to himself and to society. It is not something he must do as a member of a group. It is something he must do as an individual. The reason he is not doing it is because he has come to believe that it is not his job, but the job of the group. He has relinquished his responsibility as an individual. And, if he does not change the course of his thinking, he is in danger of losing his rights as an individual. For rights mean responsibilities. And he must discharge his responsibilities to retain his rights.

Every decision in government today concerns each of us. We have the right, indeed, the obligation, to be informed and to reach independent judgments of our own, to express our opinions without fear, and to make our voices heard. Too

often we accept or blindly advocate a course of action because it happens to represent the policy of a political party or of some other group of which we are a part. This is dangerous. When an individual relinquishes his greatest right, that of deciding things for himself, and goes along with the crowd, often without even knowing which way the crowd is going, he is giving up his birthright by default.

It is the task of education to produce men and women who have adequate preparation for all the complex tasks which are so essential in American life today. We need increasing numbers of well-trained engineers, research scientists, physicians, teachers, and other professionals. But we need much more than people of professional competence. Education's real challenge is to produce men and women who know how to think; and knowing how, do it; and, having done it, voice their opinions. We should produce good citizens, men and women who know how government works, why it works, and what their responsibilities are to make it work. Education is a fundamental force in American life. The whole concept of a democratic society rests upon an informed people who have knowledge, moral convictions, ethical values, and the courage to say and do what is right. This is the challenge to education and to all people who believe in these principles.

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